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xylose and nanofiltration	0

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L8: Entry 1 of 2 File: USPT Oct 28, 1997

DOCUMENT-IDENTIFIER: US 5681728 A
TITLE: Method and apparatus for the recovery and purification of organic acids

Detailed Description Text (8):
Although it is not fully understood, it is believed by the inventors that the effectiveness of the nanofiltration filter material to remove impurities such as multivalent compounds and proteinaceous materials is based upon both the pore size characteristics of the nanofiltration filter material and the surface chemistry of the nanofiltration filter material. Accordingly, it is desirable to use a nanofiltration filter material having surface chemistry characteristics which enable the nanofiltration filter material to prevent at least a portion of any multivalent compounds and other charged impurities which may be in the feed material from passing through the membrane during nanofiltration. Preferred for use as nanofiltration filter materials in the present invention are composite membranes which have a negatively charged thin-film separation layer deposited on a base film. It is to be understood, however, that selection of acceptable and preferred nanofiltration filter materials can depend upon the organic acid or organic acid salt being concentrated, purified or separated. Accordingly, preferred for use in the present invention as nanofiltration filter materials when lactic acid or lactic acid salts are being concentrated, purified or separated are materials made of cellulose acetate, polyamides, polyvinyl alcohols, polysulfones, polyether sulfones, polyesters, polyureas, polyamines and ceramics. Even more preferred for use in the present invention as nanofiltration filter materials when lactic acid or lactic acid salts are being concentrated, purified or separated are DESAL-5, obtained from Desalination Systems, Inc., Escondido, Calif. and "FILM-TEC" NF-45 obtained from Dow Chemical, Minneapolis, Minn.

Detailed Description Text (24):
FIG. 1 is a flow diagram of one embodiment of an organic acid recovery and purification process according to the methods and apparatus of the present invention. For convenience, FIG. 1 will be described in relation to the recovery and purification of lactic acid. According to FIG. 1, a fermentation medium 2 and lactic acid-producing microorganisms 4, such as organisms of the genus Lactobacillus are charged to a fermentor 6. The fermentation medium 2 includes a carbohydrate-containing medium suitable for growing lactic acid-producing by the microorganisms 4. Preferably such carbohydrate-containing media is a feedstock which is of low cost such as waste materials from the manufacture of corn products (e.g. corn steep liquor) or from the production of dairy products (e.g. cheese whey hydrolysates), but can also include glucose syrup, molasses, yeast extract, starch and mixtures thereof. The fermentation medium 2 can also contain added sugars and their polymers as a carbon source, including, starches, dextrin, saccharose, maltose, lactose, glucose, fructose, mannose, sorbose, arabinose, xylose, levulose, cellobiose and molasses; fatty acids; and polyalcohols such as glycerine. The fermentation medium 2 can also contain other nutrients, such as a nitrogen source and additional salts and trace metals for growing the lactic acid-producing microorganisms 4.

Detailed Description Text (49):
The fermentation medium was filtered using a 0.1 .mu.m ceramic filter to remove the cell mass. A five gallon sample of the clarified ammonium lactate solution was sent

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to Niro Hudson Filtration Co. in Wisconsin for batch nanofiltration trials using Desal-5 and "FILM-TEC" NF-45 nanofiltration membranes simultaneously. The feed was first subjected to nanofiltration using the NF-45 nanofiltration membrane. The permeate was analyzed and the results are set forth in Table 1. The retentate from the NF-45 nanofiltration membrane was then subjected to nanofiltration with a Desal-5 nanofiltration membrane. The experimental results are summarized below in Table 1.

Detailed Description Text (50):
From Table 1, it can be calculated that 97% of the multivalent compounds (magnesium) and 79% of the proteinaceous materials were removed by the NF-45 nanofiltration membrane.

Detailed Description Text (53):
A clarified sodium lactate solution was prepared according to the fermentation and filtering process described above in Example 2, except that sodium hydroxide rather than ammonium hydroxide was used to control the pH of the fermentation medium. As in Example 2, a batch nanofiltration process with NF-45 membranes was carried out at Niro Hudson Co. in Wisconsin. Samples of both permeate and retentate were taken during the filtration to analyze the concentrations of multivalent compounds (divalent metals and sulfates), proteinaceous materials and sodium lactate.

Detailed Description Text (54):
The nanofiltration trial was carried out at a transmembrane pressure of 320 psig and at a temperature within the range of 43.degree.-44.degree. C. Three plates of NF-45 nanofiltration membranes were used. Table 2 below shows the experimental results for the various trials. The permeate and the retentate were analyzed at different concentrations to determine the nanofiltration filter material's performance. It is noted that in this table, the notation X is used to express the "concentration factor" of the analyzed samples. Accordingly, permeate 2X and retentate 2X represent the permeate and retentate, respectively, when the sample is twice as concentrated as sample 1X, and permeate 4.5X and retentate 4.5X represent the permeate and retentate, respectively, when the sample is 4.5 times as concentrated as sample 1X.

Detailed Description Text (56):
Table 2 shows an excellent rejection of the multivalent compounds (divalent metals and sulfates) and proteinaceous materials by the NF-45 nanofiltration membrane. Approximately a ten-fold reduction of the concentrations of all the major divalent metals and sulfate in the sodium lactate solution was observed after nanofiltration. The membrane rejected approximately 70% to about 80% of the proteinaceous materials present in the feed material. Table 2 also indicates that the NF-45 nanofiltration membrane allows passage of the sodium lactate. More than 80% of the sodium lactate in the feed material passed through the NF-45 nanofiltration membrane.

Detailed Description Paragraph Table (1):
TABLE 1 Experimental Results of Nanofiltration With NF-45 and Desal-5 Nanofiltration Membrane

SAMPLE	Mg (ppm)	PROTEINS (g/L)*	SAMPLE COLOR
FEED	181.4	1.76	BROWN
NF-45	4.4	0.38	COLORLESS
Desal-5	126.4	0.95	LIGHT BROWN
RETENTATE	642.9	10.7	DEEP BROWN

*Protein concentrations were determined by the Lowry assay.

Detailed Description Paragraph Table (2):
TABLE 2
Experimental Results of Nanofiltration Using NF-45

SODIUM SULFATE	Mg GLUCOSE	Ca FLUX	Mn SAMPLE	PROTEIN SAMPLE	LACTATE (ppm)	(g/L) (ppm)	(g/L) (LMH**)	COLOR
								PERMEATE

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1X 16.9 23.2 1.06 1.6 41.4 0 1.69 21 COLORLESS RETENTATE 1X 304.2 242.0 13.8 1.9 61.2 152 1.17 / BROWN PERMEATE 2X 23.4 28.4 1.54 2.2 54.2 3 0.77 14 COLORLESS RETENTATE 2X 497.2 307.6 22.0 7.9 73.9 /* 1.51 / DEEP BROWN PERMEATE 3X 38.5 39.4 1.81 2.6 64.9 37 1.58 10 COLORLESS RETENTATE 3X 691.7 345.8 30.8 10.4 82.4 /* 2.03 / DEEP BROWN PERMEATE 4.5X 56.6 45.0 2.83 2.8 78.8 12.6 2.79 8 COLORLESS RETENTATE 4.5X 1022.4 397.3 54.3 15.6 94.5 /* 2.87 / DEEP BROWN

*The datum was not obtained because of the interference of solution color in the assay.
**LMH represents liter per square meter per hour.

Current US Cross Reference Classification (12):
210/651

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☐ 1. Document ID: US 5681728 A

L8: Entry 1 of 2 File: USPT Oct 28, 1997

US-PAT-NO: 5681728
DOCUMENT-IDENTIFIER: US 5681728 A

TITLE: Method and apparatus for the recovery and purification of organic acids

DATE-ISSUED: October 28, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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US-CL-CURRENT: 435/136; 204/519, 204/522, 204/527, 204/530, 204/534, 204/536, 204/537, 204/630, 204/637, 204/638, 210/259, 210/651, 210/654, 435/137, 435/140, 435/800, 562/486, 562/580, 562/589, 562/593

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

☐ 2. Document ID: US 5503750 A

L8: Entry 2 of 2 File: USPT Apr 2, 1996

US-PAT-NO: 5503750
DOCUMENT-IDENTIFIER: US 5503750 A

TITLE: Membrane-based process for the recovery of lactic acid by fermentation of carbohydrate substrates containing sugars

DATE-ISSUED: April 2, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Russo, Jr.; Lawrence J.	Mishawaka	IN	46545	
Kim; Hyung S.	Osceola	IN	46561	

US-CL-CURRENT: 210/641; 210/259, 210/651

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Draw De

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L9: Entry 1 of 3 File: EPAB Jan 8, 2004

PUB-NO: WO2004003236A1
DOCUMENT-IDENTIFIER: WO 2004003236 A1
TITLE: CRYSTALLIZATION OF SUGARS

PUBN-DATE: January 8, 2004

INVENTOR-INFORMATION:

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APPL-NO: FI00300521
APPL-DATE: June 26, 2003

PRIORITY-DATA: FI20021262A (June 27, 2002)

INT-CL (IPC): C13 D 3/16; C13 F 1/02; C13 K 7/00; C13 K 11/00; C13 K 13/00

ABSTRACT:

The invention relates to removing crystallization inhibitors from a solution comprising one or more reducing sugars by nanofiltration, hydrolysis and/or chromatography.The reducing sugars are typically selected from fructose and xylose.

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L9: Entry 2 of 3 File: EPAB Jul 11, 2002

PUB-NO: WO002053783A1
DOCUMENT-IDENTIFIER: WO 2053783 A1
TITLE: RECOVERY OF XYLOSE

PUBN-DATE: July 11, 2002

INVENTOR-INFORMATION:

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NYSTROEM MARIANNE	FI

APPL-NO: FI00101157
APPL-DATE: December 28, 2001

PRIORITY-DATA: FI20002865A (December 28, 2000)

INT-CL (IPC): C13 K 13/00

ABSTRACT:

The invention relates to a process of producing a xylose solution from a biomass hydrolysate by subjecting the biomass hydrolysate to nanofiltration and recovering as the nanofiltration permeate a solution enriched in xylose. The biomass hydrolysate used as starting material is typically a spent liquor obtained from a pulping process.

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